

Amendment and Response

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Confirmation No.: 1894

Filed: December 27, 2001

For: MOVING OBJECT ASSESSMENT SYSTEM AND METHOD

Amendments to the Claims

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

1. (Currently Amended) A method for use in monitoring a search area, the method comprising:
 - positioning a plurality of imaging devices to provide image data covering a defined search area, wherein each field of view of each imaging device comprises a field of view portion which overlaps with at least one other field of view of another imaging device;
 - selecting and physically marking the defined search area with a plurality of non-movable landmark points of commonality in field of view portions which overlap;
 - fusing all the image data from the plurality of imaging devices into a single image using the image data corresponding to the a plurality of physically marked landmark points of commonality in field of view portions which overlap;
 - segmenting foreground information of the fused image data from background information of the fused image data;
 - using the foreground information to provide object path data representative of at least one object path of one or more moving objects in the search area;
 - providing one or more defined normal and/or abnormal object path feature models based on one or more characteristics associated with normal or abnormal object paths of moving objects; and
 - comparing the object path data to the one or more defined normal and/or abnormal object path feature models for use in determining whether the at least one object path is normal or abnormal.
2. (Original) The method of claim 1, wherein at least one of the one or more characteristics associated with normal or abnormal object paths comprises the trajectory thereof.

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3. (Original) The method of claim 1, wherein the one or more defined normal and/or abnormal object path feature models comprise one or more defined normal object path feature models based on one or more characteristics associated with normal object paths, wherein the object path data is compared to the one or more defined normal object path feature models to determine whether the at least one object path is normal, and further wherein if the at least one object path is not normal then the method further comprises providing an alarm.

4. (Original) The method of claim 1, wherein providing one or more defined normal and/or abnormal object path feature models comprises providing one or more defined threatening and/or non-threatening object path feature models based on one or more characteristics associated with threatening and/or non-threatening object paths; and

wherein comparing the object path data to the one or more defined normal and/or abnormal object path feature models comprises comparing object path data to the one or more defined threatening and/or non-threatening object path feature models for use in determining whether the at least one object path indicates occurrence of a threatening event.

5. (Original) The method of claim 1, wherein providing one or more defined normal and/or abnormal object path feature models based on one or more characteristics associated with normal or abnormal object paths of moving objects comprises:

providing object path data representative of a plurality of object paths corresponding to a plurality of moving objects in the search area over a period of time;

grouping the plurality of object paths into one or more clusters based on the commonality of one or more characteristics thereof; and

identifying the one or more clusters as normal object path clusters comprising a plurality of object paths representative of normal object paths of moving objects in the search area or clusters comprising a single object path or a smaller number of object paths relative to the number of object paths in the normal object path clusters.

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6. (Original) The method of claim 5, wherein providing one or more defined normal and/or abnormal object path feature models based on one or more characteristics associated with normal or abnormal object paths of moving objects comprises using the object path data representative of an object path in a cluster comprising a single object path or a relatively smaller number of object paths than the normal object path clusters to define one or more defined normal and/or abnormal object path feature models.

7. (Original) The method of claim 5, wherein identifying the one or more clusters as normal object path clusters or clusters comprising a single object path or a relatively smaller number of object paths than the normal object path clusters comprises identifying the one or more clusters as non-threatening object path clusters comprising a plurality of object paths representative of non-threatening object paths of moving objects in the search area or clusters comprising a single object path or a relatively smaller number of object paths than the non-threatening object path clusters, and further wherein the method comprises determining whether any of the clusters comprising single object paths or the relatively smaller number of objects paths are to be used to define one or more defined threatening and/or non-threatening object path feature models for use in determining whether an object path indicates occurrence of a threatening event.

8. (Original) The method of claim 1, wherein the moving object is one of a person or vehicle.

9. (Cancelled)

10. (Original) The method of claim 1, wherein providing object path data representative of at least one object path of one or more moving objects in the search area comprises:
providing at least one object path tracked in the search area; and
calculating one or more features associated with the at least one object path.

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11. (Currently Amended) A system for use in monitoring a search area, the system comprising:

a plurality of imaging devices positioned to provide image data covering a defined search area, wherein each field of view of each imaging device comprises a field of view portion which overlaps with at least one other field of view of another imaging device, wherein a plurality of non-movable landmark points of commonality in field of view portions which overlap are selected and physically marked in the defined search; and

a computer apparatus operable to:

fuse image data from the plurality of imaging devices into a single image, wherein image data corresponding to the a plurality of physically marked landmark points of commonality in field of view portions which overlap is used to fuse the image data;

segment foreground information of the fused image data from background information of the fused image data;

use the foreground information to provide object path data representative of at least one object path of one or more moving objects in the search area;

recognize one or more defined normal and/or abnormal object path feature models based on one or more characteristics associated with normal or abnormal object paths of moving objects; and

compare the object path data to the one or more defined normal and/or abnormal object path feature models for use in determining whether the at least one object path is normal or abnormal.

12. (Original) The system of claim 11, wherein at least one of the one or more characteristics associated with normal or abnormal object paths comprises the trajectory thereof.

13. (Original) The system of claim 11, wherein the one or more defined normal and/or abnormal object path feature models comprise one or more defined normal object path feature

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models based on one or more characteristics associated with normal object paths, wherein the computer apparatus is further operable to compare the object path data to the one or more defined normal object path feature models to determine whether the at least one object path is normal, and further wherein the system comprises an alarm device operable to provide an alarm if the at least one object path is not normal.

14. (Original) The system of claim 11, wherein the one or more defined normal and/or abnormal object path feature models comprise one or more defined threatening and/or non-threatening object path feature models based on one or more characteristics associated with threatening object paths, and further wherein the computer apparatus is operable to compare object path data to the one or more defined threatening and/or non-threatening object path feature models for use in determining whether the at least one object path indicates occurrence of a threatening event.

15. (Original) The system of claim 14, wherein the computer apparatus is further operable to:

provide object path data representative of a plurality of object paths corresponding to a plurality of moving objects in the search area over a period of time;

group the plurality of object paths into one or more clusters based on the commonality of one or more characteristics thereof; and

identify the one or more clusters as normal object path clusters comprising a plurality of object paths representative of normal object paths of moving objects in the search area or clusters comprising a single object path or a smaller number of object paths relative to the number of object paths in the normal object path clusters.

16. (Original) The system of claim 15, wherein the computer apparatus is further operable to use the object path data representative of an object path in a cluster comprising a single object path or a cluster comprising a smaller number of object paths relative to the number of object

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paths in the normal object path clusters to define one or more defined normal and/or abnormal object path feature models.

17. (Original) The system of claim 15, wherein the computer apparatus further is operable to identify the one or more clusters as non-threatening object path clusters comprising a plurality of object paths representative of non-threatening object paths of moving objects in the search area or clusters comprising a single object path or a smaller number of object paths relative to the number of object paths in the non-threatening object path clusters, and further wherein the computer apparatus is operable to determine whether any of the clusters comprising single object paths or the smaller number of object paths relative to the number of object paths in the non-threatening object path clusters are to be used to define one or more defined threatening and/or non-threatening object path feature models for use in determining whether an object path indicates occurrence of a threatening event.

18. (Cancelled)

19. (Original) The system of claim 11, wherein the computer apparatus is operable to recognize at least one object path tracked in the search area and calculate one or more features associated with the at least one object path.

20. (Currently Amended) A computer implemented method for use in analyzing one or more moving object paths in a search area, the method comprising:

positioning a plurality of imaging devices to provide image data covering a defined search area, wherein each field of view of each imaging device comprises a field of view portion which overlaps with at least one other field of view of another imaging device;

selecting and physically marking the defined search area with a plurality of non-movable landmark points of commonality in field of view portions which overlap;

fusing all the image data from the plurality of imaging devices into a single image using

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the image data corresponding to the a plurality of physically marked landmark points of commonality in field of view portions which overlap;

segmenting foreground information of the fused image data from background information of the fused image data;

using the foreground information to provide object path data representative of a plurality of object paths corresponding to a plurality of moving objects in the search area over a period of time;

grouping the plurality of object paths into one or more clusters based on the commonality of one or more characteristics thereof; and

identifying each of the one or more clusters as normal object path clusters comprising a plurality of object paths or small clusters comprising a single object path or a smaller number of object paths relative to the number of object paths in the normal object path clusters, wherein each of the object paths in the normal object path clusters is representative of a normal object path of a moving object in the search area.

21. (Original) The method of claim 20, wherein identifying each of the one or more clusters as normal object path clusters or small clusters comprises identifying the one or more clusters as non-threatening object path clusters comprising a plurality of non-threatening object paths or potential threatening object path clusters comprising a single object path or a smaller number of object paths relative to the number of object paths in the non-threatening object path clusters, wherein each of the object paths in the non-threatening object path clusters is representative of an object path of a moving object that is not indicative of a threatening event.

22. (Original) The method of claim 21, wherein the method comprises analyzing each of the object paths in the potential threatening object path clusters to determine whether the object path indicates occurrence of a threatening event.

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23. (Original) The method of claim 20, wherein the method further comprises:
- using information associated with the one or more objects paths of the identified normal object path clusters or the small clusters to define at least one feature model indicative of a normal and/or abnormal object path; and
 - acquiring additional object path data representative of at least one object path of a moving object; and
 - comparing the additional object path data to the at least one defined feature model to determine whether the at least one object path is normal or abnormal.
24. (Currently Amended) A method for monitoring a moving object in a search area, wherein the method comprises:
- positioning a plurality of imaging devices to provide image data covering a defined search area, wherein each field of view of each imaging device comprises a field of view portion which overlaps with at least one other field of view of another imaging device;
 - selecting and physically marking the defined search area with a plurality of nonmovable landmark points of commonality in field of view portions which overlap;
 - fusing all the image data from the plurality of imaging devices into a single image using the image data corresponding to the a plurality of physically marked landmark points of commonality in field of view portions which overlap;
 - segmenting foreground information of the fused image data from background information of the fused image data;
 - using the foreground information to provide object path data representative of at least one object path of one or more moving objects in the search area;
 - providing one or more defined non-threatening and/or threatening object path feature models based on one or more characteristics associated with non-threatening and/or threatening object paths of moving objects in the search area; and
 - comparing the object path data to the one or more defined non-threatening and/or threatening object path feature models for use in determining whether the at least one object path

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is indicative of a threatening event.

25. (Currently Amended) A system for use in monitoring a moving object in a search area, wherein the system comprises:

a plurality of imaging devices positioned to provide image data covering a defined search area, wherein each field of view of each imaging device comprises a field of view portion which overlaps with at least one other field of view of another imaging device, wherein a plurality of non-movable landmark points of commonality in field of view portions which overlap are selected and physically marked in the defined search area;

means for fusing all the image data from the plurality of imaging devices into a single image using the image data corresponding to the a plurality of physically marked landmark points of commonality in field of view portions which overlap;

means for segmenting foreground information of the fused image data from background information of the fused image data;

means for using the foreground information to provide object path data representative of at least one object path of one or more moving objects in the search area;

means for recognizing one or more defined non-threatening and/or threatening object path feature models based on one or more characteristics associated with non-threatening and/or threatening object paths of moving objects in the search area; and

means for comparing the object path data to the one or more defined non-threatening and/or threatening object path feature models for use in determining whether the at least one object path is indicative of a threatening event.